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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/004,152	10/24/2001	Jack A. Mandelman	FIS920010265US1(14912)	8522

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EXAMINER

BLUM, DAVID S

ART UNIT PAPER NUMBER

2813

DATE MAILED: 11/04/2002

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/004,152

Applicant(s)

MANDELMAN ET AL.

Examiner

David S Blum

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 September 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____. | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The corrected or substitute drawings were received on 9/10/02. These drawings are accepted.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 5-14, and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verret (US005298450A) in view of Wei (US005950093A).

Verret teaches all of the positive steps of claims 1-3, 5-14, and 16-20 except for forming a plurality of apertures. Verret forms a pad oxide (32) layer on silicon substrate 30, and nitride layer (34) on the oxide layer forming a mask layer. Photoresist 32 is formed on the nitride layer and patterned to expose an area of the substrate. The block mask (photoresist) is removed and a second photoresist is formed and patterned) column 4 lines 1-12). The substrate is etched by reactive-ion etching (RIE, column 4 lines 13-15) to form trench 46. After the first trench etch, the photoresist is removed from selected areas (column 4 lines 30-31 and figure 5) and a second trench is etched by methods similar to the first etch (thus RIE). Verret teaches that "trench 46 is preferably etched to

Art Unit: 2813

a depth somewhat less than eventually desired, as a subsequent etch to be described below is effective to extend the trench deeper into substrate 30" (column 4 lines 26-29). Thus Verret teaches deepening the first trench simultaneously with the formation of the second trench (also see column 4 lines 39-40).

Regarding claims 10 and 11, where a third area is masked and then exposed to form a third set of trenches, this is essentially a repetition of the steps Verret uses to form the second set of trenches. Once the process has been taught, the repetition of the process is obvious. The mere duplication of parts, or in this case the duplication of process steps to form the duplicate parts does not represent novelty, but rather, once Verret teaches the process for forming a trench, its duplication is obvious.

In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) (Claims at issue were directed to a water-tight masonry structure wherein a water seal of flexible material fills the joints which form between adjacent pours of concrete. The claimed water seal has a "web" which lies perpendicular to the workface and in the joint, and a plurality of "ribs" which are parallel to the workface, forming the following shape:

The prior art disclosed a flexible water stop for preventing passage of water between masses of concrete in the shape of a plus sign (+). Although the reference did not disclose a plurality of ribs, the court held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced.).

Art Unit: 2813

The trenches are filled with deposited isolation material (un-doped polysilicon 62) and planarized (column 5 lines 24-26 and 41-42). Although Verret does not explicitly teach a plurality of each aperture, one would argue that alluding to different isolation trenches for different type circuits suggests a plurality, if not in each circuit then by the plurality of circuits. One skilled in the art would know that a plurality of trenches are formed in a substrate simultaneously. This is a duplication of parts as cited above.

Wei teaches all of the positive steps of claims 1-20 except for providing a mask stack atop the semiconductor substrate (200) surface prior to forming the first aperture, or that there may be a plurality of (first) apertures. Wei forms the first aperture (alignment mark 202) but is silent as to how the mark is made. As the alignment mark is a trench opening in a substrate, the teachings of Verret, (patterned a mask and exposing the substrate in the area to be exposed), one skilled in the art would know to form a patterned mask, exposing the substrate in the area to be etched. Wei then forms a stack of oxide (204) and nitride (206), and a photoresist (column 3 line 1) to define trench pattern and expose the first aperture. By patterning a deposited photoresist, Wei is performing deposition, lithography, and etching. Wei then etches to form new trenches (208 and figure 2B) and deepen the first aperture. Thus Wei is teaching a plurality of trenches.

Verret has a top patterned masking layer (resist 36) that exposes a portion of the pad stack (figure 2). Exposed portions of the pad stack are removed to expose portions of

Art Unit: 2813

the substrate abutting a patterned mask layer (42) as in figures 3 and 4 to form the first apertures. A portion of the mask layer covers part of the pad stack sidewalls, but this is not precluded from the claims as written. Then a portion of the block mask is removed over a second area of the pad stack layer, exposed portions of the pad stack are removed to expose portions of the substrate abutting the second patterned mask layer (42) as in figure 5 to form the second apertures. Thus, Verret reads on the amended limitations of claims 1 and 12.

One skilled in the requisite art at the time of the invention would modify Verret to include a plurality of apertures as taught by Wei with to produce trenches with different dimensions (Verret, Wei).

4. Claims 4 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verret (US005298450A) in view of Wei (US005950093A) as applied to claim 1 above, and further in view of Divakaruni (US006150212A).

Verret and Wei teach all of the positive steps of claims 4 and 15 except for using a hard mask of silicon or boron doped phosphorus glass (BPSG). Divakaruni teaches using a hard mask of TEOS (claim 4) or BSG (20 and 22) on the pad oxide and nitride layers to initially form trenches and then BPSG or BSG as a mask to re-etch the trenches when deepening them.

One skilled in the requisite art at the time of the invention would modify Verret and Wei to include TEOS or BPSG as the hard mask with reasonable expectation of producing trench structures with secondary etching to deepen the profile (Verret, Wei, Divakaruni).

Response to Arguments

5. Applicant's arguments filed 9/10/02 have been fully considered but they are not persuasive.

The applicant argues that the claims have been amended to positively recite that exposed portions of the pad stack are removed to expose portions of the substrate prior to removing portions of the substrate to form apertures 1 and 2. it is noted that Verret teaches this.

The applicant also argues that Verret forms a pad nitride layer and a first masking layer (photoresist 36) to expose a portion of the pad stack and then a second mask layer (42) to expose the substrate and etch the aperture, and this differs from the instant invention. It is noted that the claims refer to a "top patterned masking layer to expose portions of the pad stack" and blocking at least one region with a "first block mask". Verret clearly reads on these limitations. The applicant further argues that the first masking layer also defines the second apertures. As seen in figure 3 of Verret, the first mask layer defines the second apertures even though the mask layer is removed prior to forming the masking layer. Thus, Verret reads on these limitations and in is not necessary for Wei to alleviate a defect in Verret that does not exist.

The applicant further argues that there is no motivation to combine Verret and Wei to include a plurality of apertures. Wei teaches using a blocking mask to form an aperture and removing portions of the masking layer to form a plurality of apertures. Wei teaches

Art Unit: 2813


the obvious, in that it is known to form more than one trench opening (aperture) of a given size in a substrate. To not do so, would limit the number of devices isolated on a chip to 3.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (703)-306-9168 and e-mail address is David.blum@USPTO.gov.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached at (703)-308-4940. Our facsimile number for Before-Final Communications is (703)- 872-9318 and for After-Final Communications is (703)- 872-9319. The facsimile number for customer service is (703)-872-9317. Our receptionist's number is (703)-308-0956.

David S. Blum

October 28, 2002


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